

# MOVITRAC® 31.. Frequency Inverter

MC\_SCOPE V1.10 Software

Manual

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# SEW EURODRIVE



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## 1 Introduction

The application-oriented parameterization of digital inverters is increasingly gaining in significance as the number of inverter functions increases. In addition to its traditional drive tasks, the frequency inverter has to handle more and more application-specific control tasks. Higher-level control systems are thus relieved of drive control functions, which are often time-critical. What is more, this results in a completely new approach to improving the interface between man and machine.

The increasing complexity of drive applications requires the person commissioning the drive to have a great understanding of or much experience in control technology. These demanding technical control processes are generally optimized in terms of the performance of the drive by means of additional aids, e.g. storage oscilloscopes or analog value recorders. In order to make these drive applications simpler to understand and operate for the person commissioning the machine, additional resources are needed that enable commissioning to take place rapidly and simply.

With the MOVITRAC® 31.. frequency inverter series by SEW-EURODRIVE you no longer need measuring instruments to commission inverter drives. All you need to commission the drive and optimize control-specific parameters is a laptop (PC) and the MC\_SCOPE user software, which in addition to setting and editing the drive's parameters allows you to measure, visualize, log and document the drive application.

The MC\_SCOPE user software, the **MOVITRAC® oscilloscope**, allows you to optimize a drive application, e.g. by entering a setpoint step change, yourself. The response functions are recorded in the inverter in real time. The information obtained can then be transmitted to the PC via the unit's serial interface and displayed there in waveform. This provides you with up to five traces displayed in different colours on your screen. Similar to an oscilloscope, both the horizontal and the vertical axes can be expanded and compressed with the various oscilloscope-type functions offered by the software.

Furthermore, MC\_SCOPE offers the user the facility to record digital input and output signals from the inverter in a simple way, so that complete program sequences of the higher level control system can be recorded and analyzed subsequently.

Functions such as save, document and print, facilitate documentation of parameter settings and measured data.

Simple mouse or keyboard operation based on the SAA standard, supported by icons and an on-line Help feature, make MC\_SCOPE a simple-to-learn, easy-to-use tool.

MC\_SCOPE is used to visualize and optimize drive control parameters. Only the most important parameters which directly affect drive functions are accessible. For complete parameter adjustment of the inverter, the MC\_SHELL user interface must be used.

The MC\_SHELL program can be started directly from any menu item ( → Sec. 5.1.5 and 5.4.4) .

## Special features

Whereas the functions for real-time recording of measured variables are stored in the inverter's system software, the MC\_SCOPE user software is the interface for configuration and visualization of the process data. This provides the user with a powerful **MOVITRAC®-oscilloscope** on a PC basis. Major MC\_SCOPE features for the MOVITRAC®31.. frequency inverter include:

- Simultaneous real-time tracing of 4 measured variables (4 channels)
- - Varied choice of measured variables, e.g.
  - actual speed [rpm]
  - setpoint speed [rpm]
  - apparent current [%  $I_n$ ]
  - ramp generator input [Hz]
  - ramp generator output [Hz]
  - $I \times t$  utilization [%  $I_n$ ]
  - actual frequency [Hz]
  - DC link voltage [V]
  - temperature [°C]
  - input/output terminals [bit]
- Variable sampling time from 1ms to 1s
- Recording depth of max. 2048 sampled data points per measured value channel
- Recording length from 1ms to 2048s
- Pre-trigger function to record pre- and/or post-event history
- Edge-controlled triggering
- Numerous trigger sources including, e.g.,
  - PC (manual)
  - input terminals
  - output terminals
  - inverter faults
  - reference signals
- Setting the most important commissioning parameters of the inverter (→ Sec. 5.3)
- Status and diagnostic information about the inverter
- Individual print function for detailed system documentation

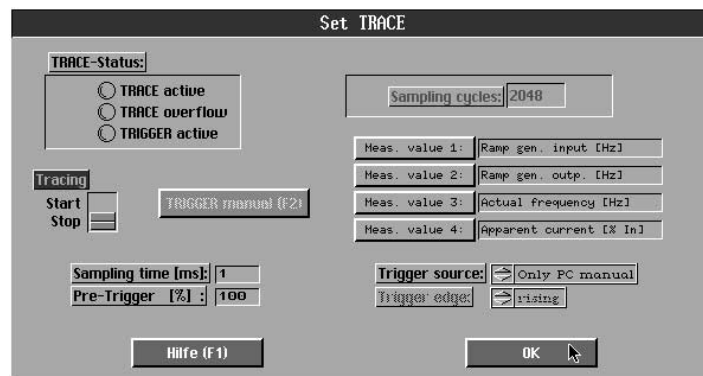
## 2 Quick Guide to Commissioning

### Establishing the communications link

- Switch off the inverter and the PC.
- Connect the two units via their RS-232 interfaces.
- Switch on both units.

### Starting MC\_SCOPE

- Start the MC\_SCOPE user interface.
- Select the PC port to which you have connected the inverter in the [Options] [Select interface...] menu item and set the MOVITRAC address to 0.
- Open the [Set Trace] window in the [MC\_SCOPE] [Set TRACE...] menu item. If the communications link has been established correctly, the following window will come up on your screen:



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Figure 1: Set TRACE

### Starting tracing

- Click on <Tracing = Start> to start tracing. The <TRACE status> LEDs will then signal the recording status of the inverter. The <TRACE active> LED indicates that measured values are being traced. At the same time all buttons are greyed out to indicate that the sampling criteria cannot be manipulated during an ongoing tracing process.
- After approx. 2 seconds the <TRACE overflow> LED indicates that the measured value buffer has been written completely once. From this point onward MC\_SCOPE can use the complete trace buffer. The buffer is constantly overwritten until tracing is stopped by operating the <TRIGGER Manual (F2)> button or the selected trigger source.

**At this point, do not perform any further settings and close the [Set TRACE] window.**

### Reading measured data

- Start the trace data transfer with the [MC\_SCOPE] [Read measured values] menu item. It will take approx. 40 seconds to transfer the contents of the trace buffer completely.
- The data are then displayed in the plot area of the main program window and are available for further processing.
- The [MC\_SCOPE] [Document...] menu item shows the tracing criteria and MOVITRAC<sup>®</sup> 31 parameters active at the time of trace data transfer. You may now add your own comments and save the data with the [Environment] [Save...] command.



## 3 Installation

### 3.1 Supported MOVITRAC® types

The MC\_SCOPE process data visualization software can be run on all MOVITRAC® 31.. frequency inverters, from version B, size 1 and higher, and is compatible with all option pcbs available for the MOVITRAC® 31.. inverter series.

### 3.2 PC system requirements

For efficient working, we recommend that you should use a PC/AT with at least an 80386 processor. The program will also support an additional mathematical co-processor if installed. Failing this, calculation of the waveform data for on-screen trace display will take significantly longer.

- PC/AT with 80386 / 80486 CPU (mathematical co-processor recommended) ideal system configuration: 80486 DX33 and higher, 256K cache memory
- minimum 570K RAM
- 3.5" disk drive (1.44MB)
- approx. 2MB free hard disk space
- MS-DOS operating system V5.0 or higher
- VGA compatible video adapter
- RS-232 serial interface to connect the MOVITRAC® 31..
- recommended: serial IBM compatible mouse

MOVITRAC® 31.. and the host PC are connected either via the RS-232 or the RS-485 serial interfaces. To establish a communications link via the RS-232 interface, the inverter must be fitted with the USS 11A "Serial interface" option. You will further need a standard serial interface cable (9-pin D-type male-to-female), which should not exceed 5m in length. To establish a communications link via the RS-485 interface, you will need an RS-232 to RS-485 converter on the PC side and the FEA 31../FIO 31.. option pcb with the RS-485 interface, or the UST 11 A (RS-485) "Serial interface" option on the inverter side.

#### Important:

Before you establish the communications link make sure that both the inverter and the PC are switched off!

Failure to do this may result in undefined system conditions.

### 3.3 Installing MC\_SCOPE

Before you install the program, please read the information update contained in the readme file. On the MC\_SCOPE diskette you will find, among others, an installation program (INSTALL.exe), which will copy all the files to the hard-disk directory specified by you. After you have inserted the diskette, start the INSTALL.EXE utility by entering:

C:\a:install 06

Then follow the program's installation instructions. For further information please read the readme file.

Unless an MC\_SCOPE directory already exists on your hard disk, the installation program will now create it for you and copy all the files from the diskette to this directory. After successful completion of the installation process your directory should include the following files:

ADAPTER.EXE	Utility to match the video adapter
ADAPTER.PRO	Current graphics driver file
HARDCOPY.PRO	Current printer driver file
HCSELECT.EXE	Utility to select/configure the printer driver
Install.EXE	MC_SCOPE installation file
MC_SCOPE.EXE	MC_SCOPE program file
MCSCOPE.D.TXT	MC_SCOPE text file (German)
MCSCOPE.D.UIR	MC_SCOPE resource file (German)
MCSCOPE.F.TXT	MC_SCOPE text file (French)
MCSCOPE.F.UIR	MC_SCOPE resource file (French)
MCSCOPGB.TXT	MC_SCOPE text file (English)
MCSCOPGB.UIR	MC_SCOPE resource file (English)
PRINTER.DAT	File with complete printer driver list
README.TXT	Text file with information update
SAMPLE_*.SCP	Sample files with MC_SCOPE measured data

### 3.4 Starting MC\_SCOPE

Change to the MC\_SCOPE directory.:

```
C:\MC_SCOPE>MC_SCOPE <ENTER>
```

No additional parameters will be evaluated. As MC\_SCOPE will take up the majority of your main memory (min. 560K), you may run into problems if you have loaded other memory-resident programs. To free as much memory space as possible, avoid starting MC\_SCOPE from other programs (i.e. PCSHELL, NC, DOSSHELL, Windows Dos Box).

### 3.5 Serial communications link

All MC\_SCOPE windows with a red header use the communications link with the MOVITRAC® 31.. frequency inverter. If the communications link between the PC and the MOVITRAC®31.. inverter has not been established or is faulty, the corresponding buttons in these windows are not active, i.e. they are dimmed (greyed out). In this case, the displayed values do not reflect the actual inverter values, they are substitutes. If you don't have a connection or if your connection is faulty, please check the following:

#### Interface cable

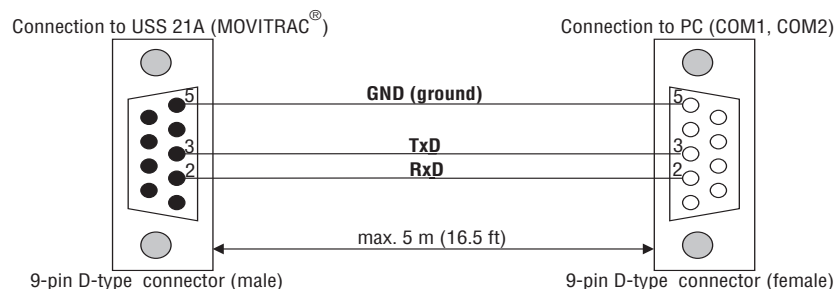


Figure 2: RS-232 connection of MOVITRAC® 31 and PC

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### PC interface

Make sure that the serial interface cable is connected to the correct COM port of your PC. Check whether the correct COM port is set in the [Options] [Select interface...] menu item.

### Communications address

If you use the RS-232 interface for communication, remember to set the MOVITRAC® address to 0 in the [Interface selection] window, independent of the unit address set in the inverter parameter menu (P 842).

If you use the RS-485 interface of the inverter, you will have to set the MOVITRAC®'s address both on the PC and on the unit itself. Make sure that the address set in the [Options] [Select interface...] menu item corresponds to the address set in the inverter (P 842 "Inverter address").

In a network setup an address may not be assigned more than once otherwise a collision of data on the transmission line would occur, resulting in a faulty communications link.

### RS-485 connection

When using the RS-485 interface check whether the ends of the two RS-485 lines are connected correctly. The terminating resistors are integrated in the interface options, i.e. when networking several inverters via the RS485 interface, no external terminating resistors may be connected to the MOVITRAC® 31.. inverters.



### Windows DOS box

The program should not be started from the Windows Dos Box as this may cause interaction problems with the serial interface and jeopardize stable program operation!

## 3.6 Utilities for printer and video adapter

MC\_SCOPE works in the graphic mode with a resolution of 640x480 dots and 16 colours. This standard IBM VGA setting is supported by all VGA compatible video adapters, it is the default setting when MC\_SCOPE is started up. The default printer setting is HP DESKJET. If your PC configuration is different from the above, use the ADAPTER.EXE utility (to match the video adapter) and the HCSELECT.EXE utility (to select/configure the printer driver) in order to modify the settings to suit your specific platform. The utility programs (dialogs are in English) are part of the LabWindows® software package by the National Instruments Corporation.

### ADAPTER.EXE

The adapter.exe utility allows you to adapt MC\_SCOPE to the video adapter installed in your PC. When selecting a different video adapter please ensure that the resolution is the same (640x480 dots). A different resolution may result in error messages and failure to start MC\_SCOPE.

Start the adapter.exe utility (C:\MC\_SCOPE>ADAPTER.EXE <Enter>). The default configuration will appear on your screen:

```
Make:      IBM
Type:      VGA
Resolution: 640x480
Colors:    16
Monitor Type: Color
```

This standard VGA mode is supported by almost every VGA compatible video adapter. You may now select one of three program functions using keys 'y', 'n' or 'q'.

#### Key:Function:

```
'y'  YES:    Accepts selected configuration and exits program.
'n'  NEW:    Selects different configuration.
'q'  QUIT:   Exits program without accepting new configuration.
```

Video adapters marked with an asterisk do not work with MC\_SCOPE! The configuration selected with the ADAPTER.EXE utility is saved to the ADAPTER.PRO file. This file is needed to operate MC\_SCOPE.

#### Recommendation:

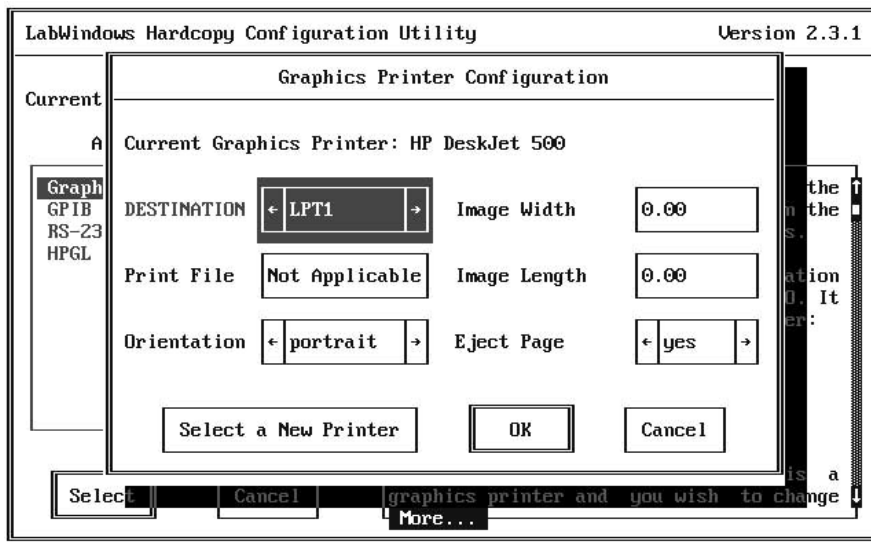
In particular on LCD screens (e.g. laptops) a 16-color display may cause flickering. For these applications a 2-color display is often preferred. To adapt the display select the following configuration:

```
Make:      IBM
Type:      MCGA
Resolution: 640x480
Colors:    2
Monitor Type: Monochrome
```

#### HCSELECT.EXE

The HCSELECT.EXE utility lets you select a printer driver for use with the [Environment] [Print...] menu item and set a scaling. The settings are stored in the corresponding HARDCOPY.PRO file. It is not possible to set these variables in MC\_SCOPE, you need to call up the HCSELECT.EXE utility to select a printer driver. Start HCSELECT.EXE (C:\MC\_SCOPE>HCSELECT.EXE <Enter> and activate the <Graphics printer>function, where you can enter your settings. All printer driver settings made with this utility only affect the graphics printout (hardcopy) of the MC\_SCOPE screen. The default configuration is:

```
Current Graphics Printer (printer type):  HP DESKJET 500
Destination (PC port):                   LPT1
Print File (Print to file)                Not applicable
Orientation:                             Portrait
Image Width:                             0.00 (1:1 mode)
Image Length:                            Auto (1:1 mode)
Eject Page (Page feed):                   Yes
```



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Figure 3: Graphics printer configuration

As all text information is generally routed to LPT1 for printout the destination port should remain set to LPT1. The printer type can be selected from a list of approx. 170 printer drivers. To do this select the function "Select a New Printer". If your printer is not listed in this printer list, please check your printer manual to determine which printer yours is compatible with and install this driver.

Printed page orientations are portrait and landscape. Image width and length are specified in inch. The entry 0.00 has a special function, it activates the 1:1 mode, i.e. the best possible print image of the selected printer. As all printouts are screen hardcopies, the 0.00 setting will provide the best possible print quality, however, the printout will only be in A5 format. Below we have listed a sample printer parameter setting for a hardcopy printout in A4 format.

Orientation:	Landscape
Image Width:	8.00
Image Length:	10.00

**Important:**

Graphics printout with a GPIB or RS-232 plotter or output to an HPGL plot file is not supported by MC\_SCOPE and may cause the program to crash.



## 4 The Main Program Window

After starting MC\_SCOPE the main program window appears on your screen (Figure 4). At the top of the screen you see the menu bar, which is either operated with the mouse or from the keyboard in accordance with the SAA standard. Immediately underneath the menu bar is the status and information line containing information about the program version and the program status. The majority of the screen is taken up by the oscilloscope display (plot area), where the acquired measured data are displayed in waveform. The bottom part of the screen is taken up by the control and display elements required for measured data analysis.



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Figure 4: The main program window

### 4.1 Status and information line

The status and information line contains information about the program version and the current program status. The display panel on the left shows the current program status. It indicates whether MC\_SCOPE is in *local mode*, i.e. no ongoing communication with the MOVITRAC® 31.. frequency inverter, or which inverter has been selected. The *MC Adr.:X* display shows the address of the inverter with which the program communicates. This address can be changed in the [Options] [Select interface...] menu item.

The program version number is displayed on the right-hand side of the status and information line immediately after program startup. If you have read in measured data from a file, the file name will be displayed there.

## 4.2 Oscilloscope display (plot area)

The oscilloscope display (plot area) takes up most of the screen. In analogy to a real oscilloscope design, the display is divided into 10 lines vertically (divisions). The horizontal division depends on the amount of measured data displayed.

A maximum of 5 channels can be displayed at the same time. The X-axis readout is a time measure. The Y-axis is assigned no particular readout as measured values with different measuring ranges/units can be displayed. As a general rule, the centre line represents the absolute zero line for all measured variables. Accordingly, the upper five divisions represent the positive value range, the lower five the negative one. The assignment of measured value trace and measured variable is evident from the trace colour.

All measured variables with the same unit of measurement are grouped in one scaling group. For each group a scaling factor can be set in the control panel area of the main window. This factor allows the traces to be expanded or compressed vertically. Setting the value range per division also provides a reference to the real measured value. The time of the trigger event is given in the lower part of the plot area and is indicated by a <TRG>.

For an exact measured value analysis two zoom cursors (white) and one measured value cursor (yellow) are available. The zoom cursors serve to zoom in on any trace section in the horizontal direction. The measured value cursor allows you, relative to the sampling instant, to read out individual measured values (please also refer to Section "Plot area control"). In addition to using the yellow measured value cursor, you may press the [Measuring] button to activate a differential measurement (delta x or delta y) if you wish to carry out a more detailed analysis (see also Section "Differential measurement").

### Control and display elements

The lower section of the main window contains a panel with various control and display elements, which are required for measured value analysis.

Control	Function: Scaling factor	Value range	Type of control
1/min/DIV	for speed measurements with the unit [rpm]	1 - 1200	Ring control
Hz/DIV	for frequency measurements with the unit Hz	1 - 30	Ring control
% In/DIV	for current measurements with the unit [%In]	5 - 50	Ring control
V/DIV	for voltage measurements with the unit V	50 - 300	Ring control

MC\_SCOPE's control of these elements includes a plausibility check, i.e. the user can only operate elements the operation of which actually makes sense given the respective program status. If no measured data were acquired, for example, the [Re-trace] function cannot be activated to start off with. For details of the controls listed, see the tables below.

Control	Key	Function	Ring control
Help	(F1)	Activates main window on-line Help	Button
Re-trace	(F2)	Waveform display of selected measured quantities (complete buffer)	
Clear	(F3)	Deletes displayed traces button	
Zoom in on X	(F4)	Zooms in on trace section between white zoom cursors (horiz.)	
Zoom out X	(F5)	Zooms out to previous trace section	
Cursor OFF/ON	(F6)	Switches zoom cursors ON/OFF	
Measured value selection	(F7)	Assigns new measured quantities to channels Y1 - Y5	Off/On button
Measuring		Activates differential measurement (delta x, delta y)	

Six display elements (see table below) provide information about the time axis X and the assignment of measured value channels Y1 to Y5. Sampling instants are plotted on the X-axis. While the X-axis legend in the oscilloscope display area indicates the number of data points sampled, i.e. not the real sampling time (!), the measured value display for the X-axis reads the real sampling time in the unit [ms] relative to the sampling instant furthest back.

To select the sampling instant on the X-axis move the yellow measured value cursor. The measured value display will then show the values of the measured variables traced on channels Y1 to Y5 at that point.

Control	Description	Measured value display
<b>X:</b>	Time axis	Current X-value of the measured value cursor
<b>Y1:</b>	Measured quantity on channel Y1 (colour: blue)	Current measured value Y1
<b>Y2:</b>	Measured quantity on channel Y2 (colour: green)	Current measured value Y2
<b>Y3:</b>	Measured quantity on channel Y3 (colour: turquoise)	Current measured value Y3
<b>Y4:</b>	Measured quantity on channel Y4 (colour: red)	Current measured value Y4
<b>Y5:</b>	Measured quantity on channel Y5 (colour: violet)	Current measured value Y5

#### 4.3 Measured value selection

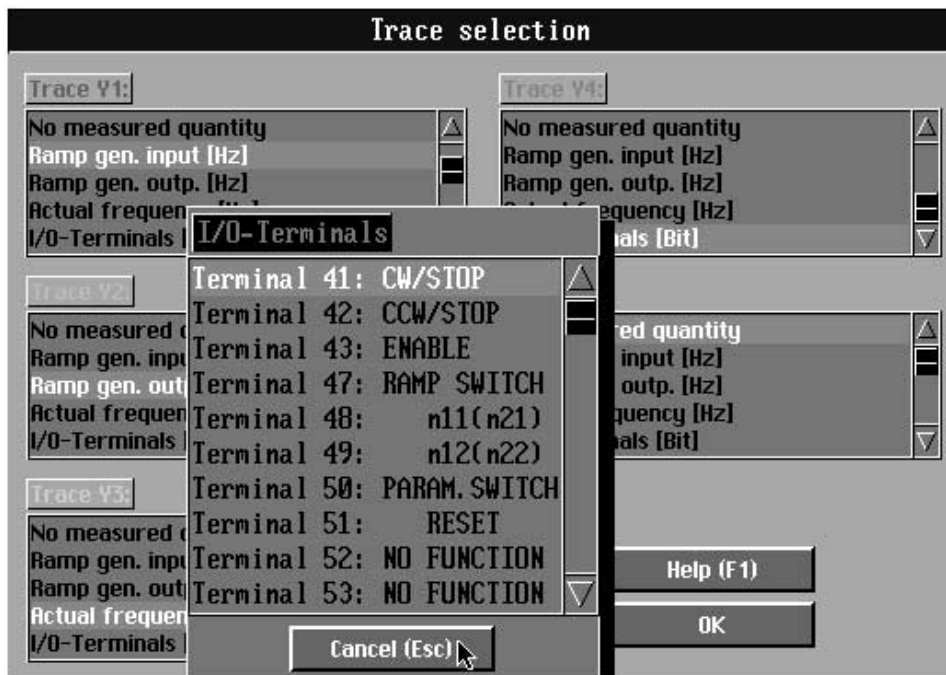
To select the measured quantities to be displayed in waveform, operate the measured value selection button. The [Trace selection] window will appear (Figure 5).

It contains five selection windows where all selectable measured quantities are displayed. You can now assign a different measured quantity to all five channels or close one or several of them (*No measured quantity*).

When using the mouse remember that the mouse pointer, after double-clicking on the desired measured quantity, should briefly change to a checkmark to indicate that your selection has been accepted.

To display individual terminal signals on your screen, select the <Input/output terminals> measured quantity. A new window will open listing all the terminals available. To select a particular terminal double-click on it or confirm your selection by pressing the ENTER key. The signal which is routed to the input/output terminal is now entered as measured quantity in the selection window. If this measured quantity is highlighted in the selection window and the trace selection confirmed with [OK], then the signal of the selected input/output terminal is displayed in the oscilloscope plot area.



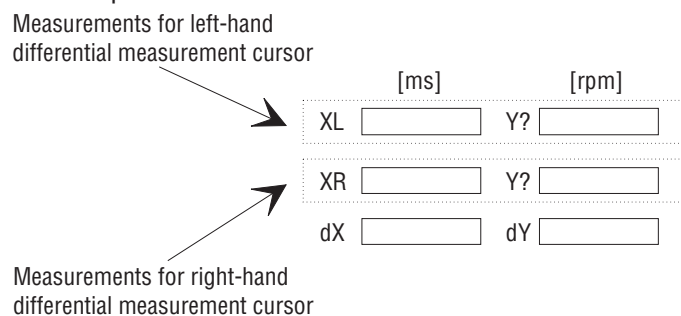


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Figure 5: The [Trace selection] window

#### 4.4 Differential measurement

The differential measurement function is activated with the [MEASURING] button in the main program window (→ Figure 7). The SEW logo is then replaced by a numerical display of the differential measurements (→ Figure 6) and the white zoom cursors are now displayed as cross hairs. The white cursors now serve as differential measurement cursors, with which the differential measurements delta x and delta y can be implemented.

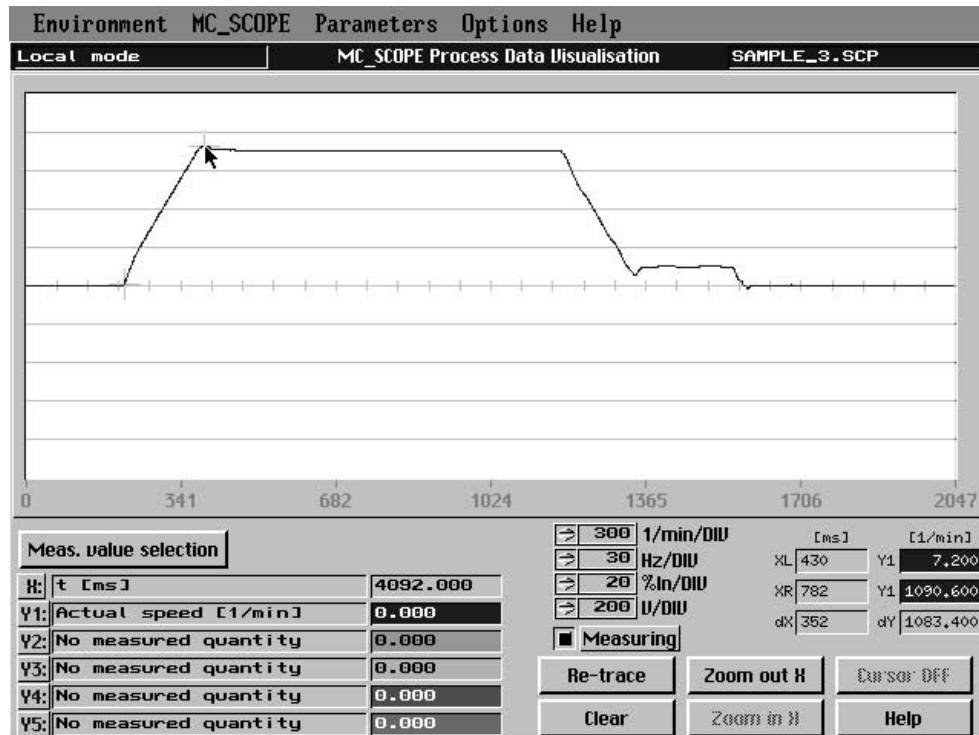


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Figure 6: Numerical display of differential measurements

As the X-axis represents the sampled data points, it is generally possible to specify delta x, i.e. the time difference between the two differential measurements cursors. On the other hand, a delta y difference measurement can only be made between two measurements in the same measurement unit. The measurements for the left-hand and right-hand differential measurement cursors are specified in the numerical differential measurement display.

As only one Y measurement can be displayed for each differential measurement cursor, these lock into the traces. The colour of the measurement background and the designation in the display field for the Y measurement give information on the quantity measured.



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Figure 7: Main program window with activated differential measurement

All five traces are displayed in the display area. The left-hand differential measurement cursor locks into the trace for the “actual speed [rpm]” measured quantity, which corresponds to the colour blue and therefore the designation Y1. In the numerical display field, the field for the Y measurement of the left-hand cursor bears the description Y1 and is highlighted in blue. This enables the measurement to be clearly allocated to the measured quantity at any time. The table below describes the display elements for differential measurement.

XL	X position of left-hand differential measurement cursor
XR	X position of the right-hand differential measurement cursor
dX	Difference between XL and XR (absolute value)
Y?	Y measurement of left-hand differential measurement cursor
Y?	Y measurement of right-hand differential measurement cursor
dY	Difference between Y measurements of the same measurement unit

The differential measurement cursors can be positioned using the mouse or the keyboard. If you use the mouse, you can click on the cursor you wish to move, and, keeping the left-hand mouse button depressed, drag it to a different position or a different trace. The display will automatically recognize the left-hand and right-hand differential measurement cursor, and, where applicable, will switch over. If you use the keyboard, you can use the ARROW RIGHT/LEFT/UP/DOWN keys to move the active cursor and/or activate the next cursor by pressing PAGE UP/DOWN. The key combinations SHIFT + PAGE UP/DOWN furthermore enable you to lock the differential measurement cursor into a different trace. This is of particular importance when the traces are so close together that it is no longer possible to position the cursor using the mouse.

It is also possible to zoom in a horizontal direction during differential measurement. To do this, the area in which you wish to use the zoom function must be delimited with the two differential measurement cursors in a similar fashion to the zoom cursors.

## 5 The Main Menu

The main menu comprises five menu titles:

[Environment], [MC\_SCOPE], [Parameters], [Options] and [Help].

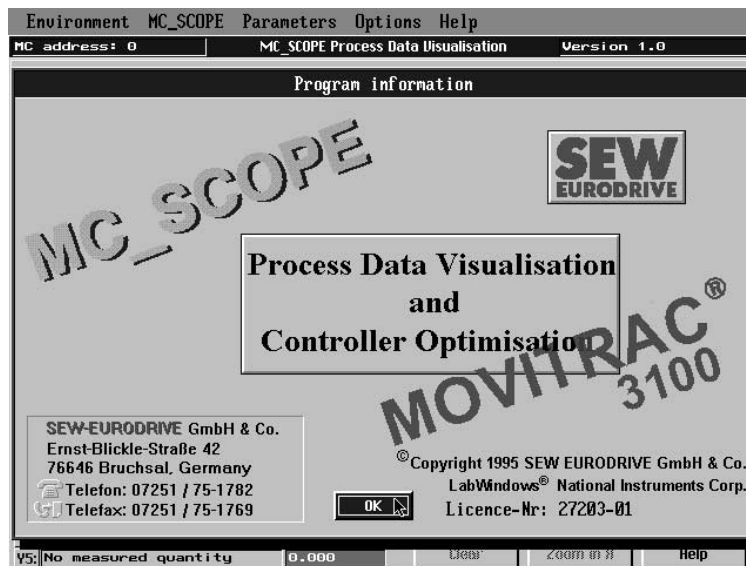
The menu options of the main menu can be activated using the mouse or from the keyboard <ALT + 1st letter of the option>.

### 5.1 Menu title [Environment]

The [Environment] menu title provides the interface to the PC environment and includes the following functions:

[Information], [Load measured value file...], [Save...], [Print...], [Start MC\_SHELL], [Exit]

#### 5.1.1 Information



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Figure 8: The [Program information] window

The [Information] menu item in MC\_SCOPE provides information about the program (version number, license number) and the Service telephone and fax numbers, which you can call if you need further information about the program and the MOVITRAC® 31..

#### 5.1.2 Loading measured value files

The [Load measured value file...] menu item allows you to read in measured values from a file, so you can document and edit system data off-line, without a communications link with a MOVITRAC® 31.. frequency inverter. When you select this menu item with the mouse or from the keyboard, a file selection window opens (Figure 9). Use the [Select] button to select the file you wish to load, or press the [Cancel] button to exit the file selection window without loading any measured data.

If you haven't saved the acquired data yet, the program will ask you whether you want to save these data or not.

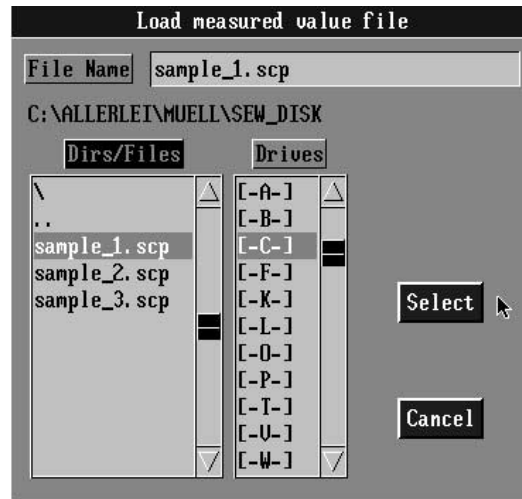


Figure 9: The file selection window

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### 5.1.3 Saving

The [Save...] menu item allows you to save acquired measured values and the parameter file active at the time of recording. Selecting this menu item will open a file selection window, prompting you to enter the name of the file to be saved. The program will only accept \*.SCP (SCOPE) as file extension of MC\_SCOPE measured value files. After you have entered the name of the measured value file you wish to save, MC\_SCOPE will check whether a measured value file of that name already exists. If it doesn't, MC\_SCOPE will prompt you to enter a system-specific comment in the program's documentation window and then save the measured value file.

### 5.1.4 Printing

Activating the [Print...] menu item will open the following window:

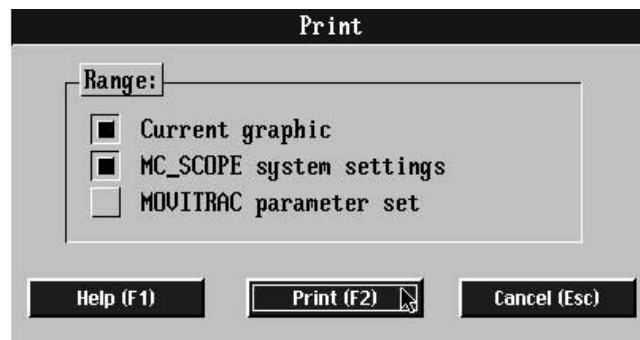


Figure 10: Printout options of the [Print] window

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- current graphic (1 page)  
graphics printout of the active main window
- MC\_SCOPE system settings  
printout of system settings such as sampling time, axis address, date/time of recording, etc. and system comment.
- MOVITRAC parameters  
printout of all parameters that can be changed in MC\_SCOPE.

Immediately before the hardcopy printout, the screen will change to monochrome display and a temporary information window will open showing an assignment legend. After printing, the screen display will return to normal and the temporary information window be closed.

**Recommendation:**

For better distinction of the printed traces, activate the trace attribute feature in the [Options] [Trace attribute...] menu item, which allows you to assign certain markings to a trace for better distinction.

**Printer driver:**

Use the HCSELECT.EXE utility to match MC\_SCOPE to the specifics of your printer, in particular for trace printout. It is not possible to set up the printer from MC\_SCOPE. For more detailed information please refer to Section 3.6 "Utilities for printer and video adapter".

**5.1.5 Starting MC\_SHELL**

The [Start MC\_SHELL] menu item will call up the MC\_SHELL user interface, exiting MC\_SCOPE permanently. If you haven't saved the acquired data yet, the program will ask you whether you want to save the data or not. It is assumed that the MC\_SHELL user interface is located in the "*MC\_SCOPE directory*\MC\_SHELL" path. You may specify this path in the [Options] [MC\_SCOPE path...] menu item. You may also start MC\_SCOPE directly from MC\_SHELL. If MC\_SHELL is not installed in the specified path, the function is aborted and a corresponding message displayed. On exiting MC\_SCOPE all program settings are saved to the MC\_SCOPE.INI initialization file.

**5.1.6 Exiting MC\_SCOPE**

To exit MC\_SCOPE select [Exit]. You will be asked whether you want to save the measured data or not. The active settings are then saved to the initialization file. These settings will be available again when MC\_SCOPE is restarted.

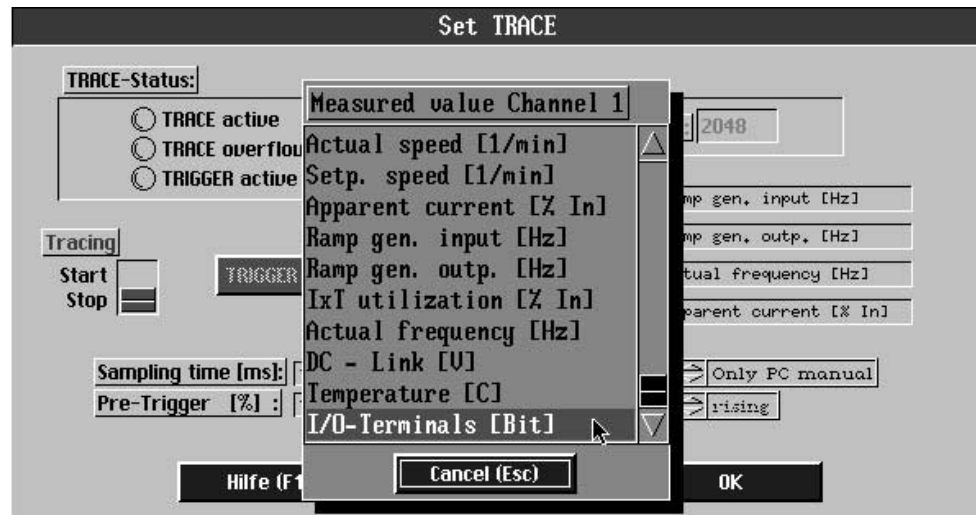
**5.2 [MC-SCOPE] menu title**

The [MC\_SCOPE] menu title contains all the functions required to set and analyze the measured data acquisition (tracing). It includes the features:

- [Set trace...]
- [Read measured data]
- [Document...]

**5.2.1 Setting trace**

The [Set trace...] menu item can only be activated if there is a communications link established with a MOVITRAC® 31.. frequency inverter, i.e. MC\_SCOPE is not in local mode. The red header of the [Set trace] window (Figure 11) indicates that in this program section, direct communication with the frequency inverter takes place. In the absence of such a communications link, the controls are inoperable, indicated by their greyed-out display. When in this condition, standard values are displayed which do represent the actual inverter status.



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Figure 11: Selection of measured values in the [Set trace] window

This window allows you to set all important tracing criteria. At the same time LED controls on the panel indicate the current trace status of the MOVITRAC® 31.. frequency inverter. In addition you can set the sampling time and select the trigger source and start, abort or stop the tracing process with a trigger event.

Control	Value	Action	Type of control
Trace active	ON	Measured value tracing active	LED
	OFF	Measured value tracing not active	
Trace overflow	ON	Trace buffer full	LED
	OFF	Trace buffer not completely written yet	
Trigger active	ON	Trigger event present	LED
	OFF	No trigger event present	
Tracing	Start	Start measured value tracing	On/Off switch
	Stop	Abort measured value tracing (no valid data)	
Number of trace cycles		Number of possible sampling cycles for these settings (depends on measured value types and number)	Output
Sampling time [ms]	1-1000	Time interval between two measuring cycles in ms	Input
Pre-trigger [%]	0-100	Specifies the number of measured values to be traced before the trigger event	Input
	0%	Trace only post-event history	
	100%	Trace only pre-event history	
Trigger source	PC only	Tracing can only be triggered manually from MC_SCOPE by operating the "Manual TRIGGER" button.	Ring control
	X terminal	Tracing may be triggered via the selected terminal as well as manually from MC_SCOPE. Active tracing is generally triggered automatically when a fault occurs.	
Trigger pulse edge:	0/1 transition 1/0 transition	State transition edge which triggers tracing via the terminals.	Ring control
Measured values 1-4:		Selection of measured variables, which are to be stored in the frequency inverter. Multiple tracing of the same variables is not possible.	Button/Selection list
Manual TRIGGER (F2)		Button for manual triggering if trigger source = PC	Button
Help (F1)		Displays on-line Help for this window	
OK (ESC)		Closes window	



The various controls of this window are explained in table 5. Operation of the controls is subject to a plausibility check by MC\_SCOPE. The setting options therefore depend on the status of the measured value tracing. During data acquisition no trace settings can be performed. Controls of blocked functions are greyed out. When the data acquisition is stopped (*Trace = stop*) or when a trigger event occurs, the trace criteria can be defined anew.

**Important:**

Aborting the measured value recording with the *<Trace = stop>* command results in the trace buffer in the frequency inverter not being written correctly. MC\_SCOPE then has no time reference as regards the measured data, i.e. it cannot detect the earliest measured value. Therefore only use the *<Trace = stop>* switch control to abort the measured value acquisition. For correct triggering, only use the selected trigger source (external terminal or PC trigger).



### 5.2.2 Reading measured values

The [Read measured values] menu item can only be activated if a communications link with a MOVITRAC® 31.. inverter is established, i.e. MC\_SCOPE is not run in local mode.

When you activate this menu item, measurement and parameter data will be read from the MOVITRAC® 31.. frequency inverter to the PC. First of all, though, different system conditions are checked. If one of the following conditions prevails, the measured data will not be read in, instead a message will appear on the screen:

- Measured value recording still active.
- MC\_SCOPE in local mode.
- The frequency inverter connected is not a MOVITRAC® 31...
- Transmission error! Please check the serial link.

Before MC\_SCOPE reads in new measured data, you will be asked whether you wish to save or discard the previously acquired data, if these have not been saved yet. MC\_SCOPE does not recognize whether the recording was ended correctly with a trigger pulse or aborted with [Trace = stop], i.e. whether the data in the trace buffer are correct.

At the beginning of the transfer the [Trace data transfer] window will appear indicating the data transfer progress in per cent. This process can be aborted any time using the ESCAPE or ENTER keys. After MC\_SCOPE has read in the buffer completely, the traces are automatically displayed on the screen.

**Important:**

When the trace buffer is read in, all system and parameter values are acquired as well. Therefore, read-in data are only valid if neither the MC\_SCOPE system values nor any other parameters were changed from the moment the data acquisition was triggered to the time the trace buffer was read in.

### 5.2.3 Documenting

The [Current trace documentation] window (Figure 12) allows you to enter your own comments to describe the measured values recorded. The text controls [Project], [Company], [Commissioned by] and [System comments] can be used separately. These text controls require an entry (e.g. \*) otherwise MC\_SCOPE will display a corresponding message. If you operate the <Settings... (F2)> button a new window will open, where all system and parameter data valid at the time of data transmission are automatically documented (Figures 12 and 13), including:

- MC\_SCOPE system information
- MOVITRAC 31.. commissioning parameters

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Figure 12: User system comments window

This window is displayed automatically before each save process prompting you to document the traced data. All entries made here are saved and printed out together with the measured value file.

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Figure 13: Automatic system documentation by MC\_SCOPE

The comments are retained while the program is running until they are overwritten when a new file is loaded or they are edited. The comment last entered is saved to the initialization file when you exit MC\_SCOPE and will be available again when the program is restarted.

### 5.3 Menu title [Parameters]

Interface to the MOVITRAC® 31.. frequency inverter, it allows you to parameterize the inverter directly and includes the following menu items:

[Motor/Inverter parameters...]  
 [Setpoints/ramp generators...]  
 [Speed control...]  
 [Synchronous operation control...]  
 [IPOS positioning...]  
 [Inverter status...]

These menu items can only be activated if a serial communications link has been established between the inverter and the PC, i.e. MC\_SCOPE is not in local mode.

#### 5.3.1 Motor/Inverter parameters

Motor parameters to match the inverter to the connected motor as well as inverter parameters.

Motor-/Inverter parameters	
201 F_BASE1 stepwise [Hz]	: 50
328 Motor size-up 1	: YES
321 Boost 1 [%]	: 0.00
322 IxR1 [%]	: 0.00
323 Slip 1 [Hz]	: 0.00
324 Pole pair number 1	: 2.00
320 I_MAX1 [% In]	: 150.00
325 PWM frequency 1 [kHz]	: 4
326 Premagnet. time 1 [ms]	: 100.00
327 Postmagnet. time 1 [ms]	: 100.00
890 4-quadrant 1	: YES

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Figure 14: MOVITRAC® 31.. parameters in the [Motor/Inverter parameters] window

#### 5.3.2 Setpoints/Ramp generators

Parameters for setting the ramp generators of parameter set 1 and the setpoint limits F-Min1 and F-Max1.

Setpoints/Ramp generators	
110 N2 signal term. 34/35	: 0-10V/0-20mA
111 Setpoint Offset [mV]	: 0.00
120 T11 ramp up [s]	: 1.00
121 T11 ramp down [s]	: 1.00
122 T11 S pattern	: 0.00
130 T12 ramp up-down [s]	: 5.00
140 T13 ramp stop [s]	: 1.00
200 F_MIN1 [Hz]	: 2.00
202 F_MAX1 [Hz]	: 50.00

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Figure 15: Parameters of the [Setpoints/Ramp generators] window

### 5.3.3 Speed control

The window for setting the speed control parameters will come up. These parameters are only effective if speed control (P770) has been activated.

Speed control	
770 Speed control	: <input type="checkbox"/> NO
771 P gain	: <input type="text" value="0.00"/>
772 Time constant [ms]	: <input type="text" value="0.00"/>
773 Number of increments	: <input type="text" value="1024"/>
774 SxR	: <input type="checkbox"/> NO
777 P Gain Precontrol	: <input type="text" value="0.00"/>
778 Time const. Setpointfilt.[ms]	: <input type="text" value="0.00"/>
779 P Gain Hold Control	: <input type="text" value="0.00"/>

Buttons: Help (F1), OK

Figure 16: Parameters of the [Speed control] window

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### 5.3.4 Synchronous operation control

The window with the most useful parameters for adjusting angular synchronism will appear. These parameters are only effective if synchronous operation control has been activated.

Synchronous operation	
762 MASTER gear ratio	: <input type="text" value="0"/>
763 SLAVE gear ratio	: <input type="text" value="0"/>
769 CONTROLLER KP factor	: <input type="text" value="0.00"/>

Buttons: Help (F1), OK

Figure 17: Parameters of the [Synchronous operation] window

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### 5.3.5 Positioning

The window with the most useful parameters for setting the parameters of the IPOS integral positioning control software. These parameters are only effective if positioning (P 770) has been activated.

Positioning IPOS	
Gain X controller	: <input type="text" value="0.50"/>
Positioning ramp [s]	: <input type="text" value="2.00"/>
Feedforward [%]	: <input type="text" value="100.00"/>
Travel speed CW [1/min]	: <input type="text" value="1500.00"/>
Travel speed CCW [1/min]	: <input type="text" value="1500.00"/>
Lag error window	: <input type="text" value="5000"/>

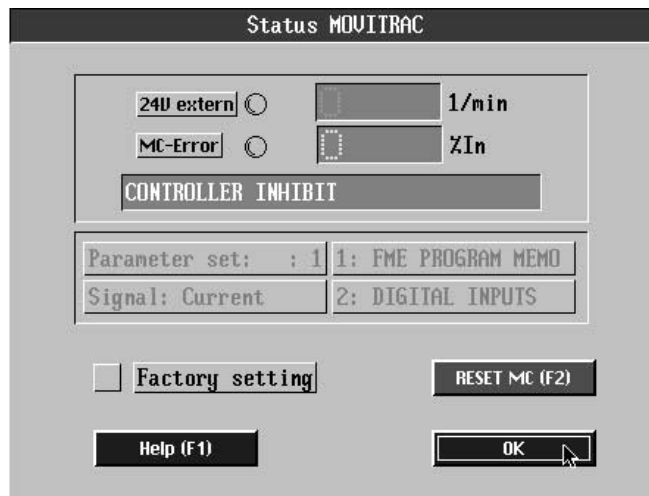
Buttons: Hilfe (F1), OK

Figure 18: Parameters of the [Positioning] window

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### 5.3.6 Inverter status

The window with the most important status information about the inverter will open.



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Figure 19: Status information in the [Inverter status] window

The following information is displayed

- Actual speed [rpm]
- Apparent current [%  $I_n$ ]
- 24V supply indicated by green LED
- Use of option slots 1 and 2
- Control signal of analog input 1
- Number of active parameter set
- Plain text display of unit status or fault message

If a fault has occurred, the inverter is reset with the <RESET MC (F2)> button. The factory setting is activated with the button of the same name in the *Controller inhibit* or *No enable* state. To avoid unintentional activation of the factory settings, you will be prompted to confirm again.

### 5.4 Menu title [Options]

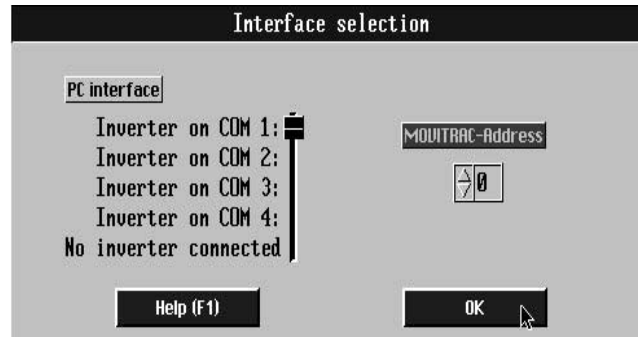
The [Options] menu title comprises features, which are required to set the MC\_SCOPE program parameters or select the type of communications link. The main menu titles includes the options:

- [Select interface...]
- [Trace attributes...]
- [Language...]
- [MC\_SHELL path]

### 5.4.1 Interface selection

The window has three controls for selection of the communication link.

<PC interface>  
<MOVITRAC address>



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Figure 20: The [Interface selection] window

Available PC interfaces are the serial ports COM1, COM2, COM3 or COM4, which can be selected, as well as the local mode, when no inverter is connected. To connect the inverter, the RS-232 interface on the *USS 11A* option pcb or the RS-485 interface on the *FEA 31../FIO 31..* option pcb or the *UST 11A* option pcb can be used.

If a communications link is established via the RS-485 interfaces of the *FEA 31../FIO 31..* or the *UST 11A* option pcbs, a valid MOVITRAC® address must be entered. To set the address, operate the <MOVITRAC® address> button. Make sure that the address set in this window corresponds to the actual inverter address (P 842 “Inverter address”).

MC\_SCOPE carries out a plausibility check for this window too, i.e. only those controls are activated the setting of which makes sense. If the <PC interface> control is set to <No inverter connected>, obviously there is no need to select the MOVITRAC® address, as no communication via the serial interface will take place.

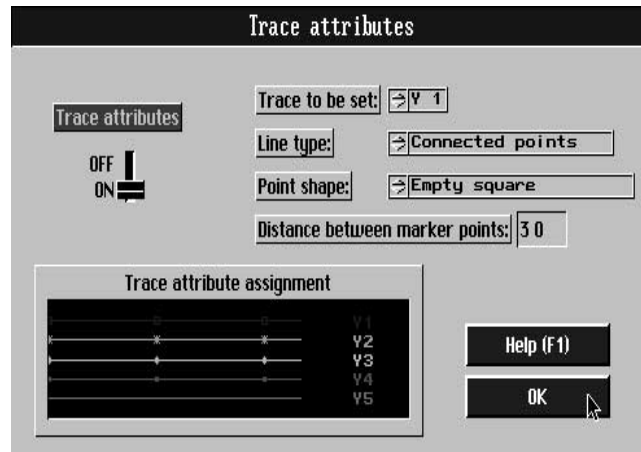
In many cases, one PC interface is already occupied by the serial mouse. If this interface is selected a corresponding fault message is displayed on the screen.

To connect frequency inverter and PC via the RS-485 interface you will need an external interface adapter which adjusts the V.24 level to the RS-485 level. We recommend the PSM-V.24/RS485-P/BB interface adapter (order no.: 2787321, PHOENIX CONTACT), which has proved a good choice with the MOVITRAC® 3000.

### 5.4.2 Traces attributes

This function will open the [Trace attributes] window (Figure 21). Since you may not always have a colour monitor available when you commission a system, it may often prove difficult or even impossible to discriminate between the different traces. The [Trace attributes] window allows you to assign trace attributes individualizing the traces. To differentiate the traces you can, for example, mark them with different symbols etc.





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Figure 21: The [Trace attributes] window

The trace attribute feature is also handy when you print out the traces, as printing would usually be in black and white.

The table below explains the different attributes and their respective controls.

Control	Value range	ActionTrace attributes
Trace attributes	ON: OF:	Plots traces with marking Plots traces as lines
Trace to be set	Y1 - Y5	Specifies measured value trace to be set
Line type	Text	Specifies line type for the measured value trace
Point shape	Text	Specifies shape of marker points
Distance between marker points	30 - 500	Specifies distance between two marker points (e.g. 70 = every 70th data point on a trace = marker point)

The trace attributes selected are indicated immediately after each change on the display panel [Trace attribute assignment]. Only the distance between the marker points is not shown. It must be checked against the actual trace.

MC\_SCOPE carries out a plausibility check for this feature, too. Trace attributes can only be assigned if the switch control setting is <Trace attributes = ON>. Otherwise all controls will be passive, i.e. greyed out.

The <Trace attributes = ON> condition where all traces are plotted with the set attributes is indicated by a checkmark which precedes the menu title ("Trace attributes").

### Important:

The amount of user memory needed to display the marked traces increases in proportion to the density of the marker points, i.e. if you see the warning "Not enough memory...." after setting the trace attributes, you should decrease the point repeat frequency.

### 5.4.3 Language (German, English, French)

The “Language” window, in which you can set the language of your choice, will open. When you select the language you require and confirm by pressing the <OK> button, the system checks whether all the necessary language files are available and switches the program over to the new language. An error message is displayed if the selected language file is not found.



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Figure 22: Language selection window

The first time you call up MC\_SCOPE, you will first see this language selection window so that you can select the language of your choice.

### 5.4.4 MC\_SHELL path

As not all MOVITRAC® 31.. parameters can be set from MC\_SCOPE, the [Environment] [Start MC\_SHELL] menu item enables you to call MC\_SHELL user interface directly. MC\_SCOPE is then exited permanently and MC\_SHELL started.

You can specify the call path in which the MC\_SHELL.EXE file is located in the [MC\_SHELL path...] menu item. When you do this, a file selection box is opened where you can enter the call path directly. If you use the <select> feature, the system checks whether the file is in the path specified; if it is not, an error message will be displayed.

This setting is stored permanently in the initialization file. The MC\_SHELL user interface is called in the usual way using the [Environment] [Start MC\_SHELL] menu item.

## 5.5 Menu title [Help]

The [Help] feature offers general on-screen information about the [Menu structure...] and the [Key assignment...].

### 5.5.1 Menu structure

This Help feature gives you a quick overview of the various features offered by the main menu options.

### 5.5.2 Key assignment

This Help feature tells you how to operate MC\_SCOPE from the keyboard.

## 6 MC\_SCOPE Files

For correct operation MC\_SCOPE requires a couple of additional files, which must be located in the same directory as the MC\_SCOPE.EXE file. These files contain important information, which is read in when MC\_SCOPE is started and, in parts, saved back to the file when you exit the program.

### Important:

All the files referred to below are created automatically (by MC\_SCOPE or its system utilities) and therefore do not require modification.



### Resource files (\*.UIR)

The resource files contain all the details of the graphics interface and must be located in the same directory as MC\_SCOPE.EXE. Each language has its own resource file. These are binary files and must not be modified, as stable program operation cannot otherwise be ensured.

### Text files (\*.TXT)

The text files contain all the ASCII texts required by MC\_SCOPE when running. Each language must have its own text file. Any modification of this file may cause MC\_SCOPE to crash and hence is not permitted!

### ADAPTER.PRO video adapter file

This file contains the details of the system-specific adaptation of your video adapter. It is generated by the ADAPTER.EXE utility and read by MC\_SCOPE. For use in a network setup this file must be located in a separate directory for each user with read-write access rights and be accessible via the LWPROFILES DOS variable.

### HARDCOPY.PRO printer file

The HARDCOPY.PRO file contains all the settings for the selected printer driver. It is generated by the HCSELECT.EXE utility and required by MC\_SCOPE for hardcopy printout. For use in a network setup, this file must be located in a separate directory for each user with read-write access rights and be accessible via the LWPROFILES DOS variable.

For use in a network setup, this file must be located in a separate directory for each user with assigned read-write access rights and be accessible via the LWPROFILES DOS variable.

**The PRINTER.DAT file**

This file is used by the HCSELECT.EXE utility and contains a list of all supported printer drivers. It must be located in the current program directory together with the MC\_SCOPE.EXE and HCSELECT.EXE files.

**Readme file**

This file contains up-to-date information about the program version supplied. Please read this information carefully before you install the program.

**MC\_SCOPE measured value files (\*.SCP)**

These files are MC\_SCOPE measured value files. They contain sample traces from the MOVITRAC® 31.. frequency inverter. All MC\_SCOPE measured value files are saved in ASCII format. They should not be modified, however, as loss of data may result.

## 7 Messages

This section describes all the messages that can occur when working with MC\_SCOPE. In general, messages will be displayed on the screen as information or decision windows. To continue with the program, you have to acknowledge these messages. In the case of information windows, MC\_SCOPE issues a message which you have to acknowledge either by pressing the <OK> button or with the <ESCAPE> key. In the case of decision windows, MC\_SCOPE displays the message as a question which you have to answer. You thus determine yourself how the program is to continue.

### 7.1 Information windows

Below you will see all the possible messages which may occur when using MC\_SCOPE.

**0: File faulty or not an MC\_SCOPE file!**

You entered a wrong file name when loading a file or the file specified is faulty.

**1: File not found!**

The specified file is not located in the current directory.

**2: No measured data available!**

There are currently no measured data in the user memory. Load a measured value file or read new measured values from the inverter.

**3: Only .SCP file extension allowed!**

When saving the measured values, only file names ending in the extension \*.SCP are allowed.

**4: PC interface not available/occupied!**

The PC interface (COM port) you have selected is occupied by the mouse or is not available on your PC.

**5: Function not supported in this DEMO version!**

The required function cannot be used in this DEMO version of MC\_SCOPE.

**6: Please observe correct sequence!**

Please observe the correct sequence when selecting measured variables.

**7: The same measured values cannot be traced more than once!**

Multiple tracing of the same measured values on different SCOPE channels is pointless as absolutely identical values would be traced.

**8: The selected unit is not a MOVITRAC<sup>®</sup> 31.. inverter!**

You have tried to set up a communications link with an unfamiliar unit. This unit has not been identified as a MOVITRAC<sup>®</sup> 31.. frequency inverter.

**9: No measured data available!**

There are currently no measured data in the user memory. Load a measured value file or transfer new measured values from the inverter.

**10: Select section with zoom cursors!**

Use the zoom cursors to first delimit a section which is to be zoomed in on horizontally.

**11: Preliminary test version! Not a customer version!**

This preliminary program version is valid for a limited period only and may contain errors, it is only for SEW internal use. It cannot be guaranteed that the program will run smoothly and that parameterization can be performed correctly. **This software must not be made available to customers!**

**12: Not possible in the DEMO version!**

This function is not possible in the DEMO version of MC\_SCOPE.

**13: Insufficient user memory! Tracing interrupted!**

There is not sufficient memory available for a graphic display of the traces. Tracing is interrupted, not all traces may be displayed. MC\_SCOPE requires approximately 560K of free memory. Otherwise the program may not run properly!

**14: Check printer connection!**

The printer is offline or not connected. Check the printer cable and settings.

**15: No data exported!**

No measured data has been exported.

**16: Not implemented!**

This function is not implemented in the current program version.

**17: Tracing still active!**

The measured data recording function in the inverter is still active. No changes to the MC\_SCOPE system parameters can be made in this state. It is also not possible to read measured data from the inverter in this state.

**18: MC\_SHELL.EXE not found in specified path!**

The MC\_SHELL.EXE program has not been found in the directory path given in the [Options] [MC\_SHELL path...] menu item. Please check the path entry in the [Options] [MC\_SHELL path...] menu item.

**19: File not found!**

The language files for the language selected are not available or not complete.

**20: Tracing aborted! No data available!**

You have aborted a measured value tracing. No valid measured data are available. Measured value tracings may only be ended correctly with a trigger pulse (PC or external terminal).



**21: Cannot run program! Please exit MC\_SCOPE!**

MC\_SCOPE cannot run because of memory problems. Exit the program and ensure that at least 560K of free memory is available.

**22-25: Messages 22 to 25 are irrelevant to this program version.**

**26: Transmission error! Please check serial connection!**

A transmission error has occurred. Check the serial connection and the inverter address (P842 "Inverter address") against the inverter address set in MC\_SCOPE. Please see section 2.5, Serial communications link, for more information.

**27-29: Messages 27 to 29 are irrelevant to this program version.**

**30: File already exists! Please choose new file name!**

A file with the file name specified already exists. Please choose another name.

**31-35: Messages 31 to 35 are irrelevant to this program version.**

**36: Parameter lock active! Parameterization not possible!**

You have activated the "*Parameter lock = YES*" parameter. The inverter cannot be parameterized. Remove the parameter lock before transmitting a parameter file.

**37: MC\_SCOPE function not implemented in the inverter.**

MC\_SCOPE cannot be activated with the frequency inverter connected. The MC\_SCOPE functionality has not been implemented in the frequency inverter.

## 7.2 Decision windows

The following messages require you to make a decision as to how the program is to continue. The following messages may occur:

**0: Current measured data not saved! Do you wish to save?**

The measured data currently loaded have not been saved to a file.

**Yes:** Save the measured data in a measured value file and continue the program.

**No:** Cancel the current measured data, i.e. do not save them and continue the program straightaway.

**1: Data file (\*.SCP) already exists! Do you want to overwrite it?**

A data file of the same name already exists. Do you still want to save it?

**Yes:** The existing data file will be overwritten and will be lost.

**No:** The existing data file will not be overwritten; a new file name will be chosen.

**2: Are you sure you want to exit MC\_SCOPE?**

You have activated the [Environment] [Exit] menu item to exit MC\_SCOPE.

**Yes:** Exits MC\_SCOPE correctly, all settings are saved in the MC\_SCOPE.INI initialization file.

**No:** MC\_SCOPE is not exited.

**3: Are you sure you want to start MC\_SHELL?**

You have activated the [Environment] [Start MC\_SHELL] menu item to switch to the MC\_SHELL user interface.

**Yes:** Exits MC\_SCOPE correctly, all settings are saved in the MC\_SCOPE.INI initialization file. Then the program automatically switches to the MC\_SHELL directory, calling up the MC\_SHELL user interface.

**No:** The program does not switch to the MC\_SHELL user interface.

**4: Parameter data do not relate to measured data! Load anyway?**

A parameter file of the same name as the measured data file was found, however their date and time attributes do not match. Consequently, there is no guarantee that the two files actually describe the same parameter set. Do you still wish to load the parameter file to your PC?

**Yes:** The parameter file is loaded to the PC together with the measured data file. This enables you to take a look at the parameter settings effective at the time when the measured values were recorded. To do this, you have to activate the [MC\_SCOPE] [Document...] menu item.

**No:** Only the measured value file will be loaded to the PC. In the [MC\_SCOPE] [Document...] menu item, only the details of the measured value file will be displayed.

**5:** This message is not implemented!

**6: Do you really want to abort the data transmission?**

You have aborted the transmission of measured data from the MOVITRAC® frequency inverter.

**Yes:** The data transmission will be aborted and all transmitted data discarded.

**No:** The data transmission will be continued.

**7: Transmission error! Repeat data transmission?**

Errors have occurred during data transmission. Check your communications link.

**Yes:** The data transmission is continued. The faulty message is repeated again.

**No:** The data transmission is aborted.

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